

SCIENCE.

FRIDAY, JANUARY 14, 1887.

COMMENT AND CRITICISM.

THE DANGER of long-range weather-prediction, even of the cautious kind lately indulged in by Dr. Hinrichs, is forcibly illustrated in the statements given in the advance proof of the Iowa bulletin for December. The month is described as very cold, fair, and dry, the mean temperature of the air being more than seven degrees below the normal. Only once in the past sixteen years has Iowa had a colder December (1876). This is not a satisfactory verification of the statement made a month ago: "The probability is very high that the winter now begun will be a mild one in Iowa and the north-west." Apparently as a comment on this discordance, Dr. Hinrichs says, "January will, it seems, also run decidedly below normal. February may be markedly above normal, and contribute greatly to reduce the severity of the winter [a possibility very much to be desired]. During the forty years preceding 1883, there never have been more than two consecutive cold winters in Iowa; namely, those of 1856 and 1857. Beginning with 1883, we have now had four severe winters in unbroken succession, and these winters have not been followed by a month of severe weather this winter. This is entirely without precedent, and of very serious import to the people of Iowa." That seems to be the difficulty: the weather cares too little for precedent.

THE HOLIDAY EDITION of the *Age of steel* deserves attention because of the number and interest of the economic articles it contains. In fact, it seems more like an economic than a technical journal. It is somewhat of a novelty, too, to find that the economics are thoroughly practical, the theoretical and speculative element occupying a very subordinate place. M. Godin, the founder of the Familistere, tells again briefly the well-known story of that institution. At the end of his article, the philanthropist grows confidential, and points out the principal obstacle with which his foundation has to contend. That obstacle is, as might have been suspected, nothing less than human nature itself. And it has happened in this

way. The association has made large profits, which have been published every year. A knowledge of the detailed operations of the concern is accessible to the public. Just here the difficulty presented itself.

In the language of M. Godin, "instead of studying them [the annual balance-sheet, and so forth] for the purpose of imitating us by organizing labor, this is the way the filibusters in industry have argued: they have said to themselves, 'The Association of the Familistere pays actually about 1,800,000 francs (\$360,000) in wages. If we establish a similar industry, copy its products, and pay 50 per cent less to our operatives than the Society of the Familistere pays theirs, we shall realize profits amounting to nearly a million more than it; so that it cannot compete with us, except it lowers wages,—a thing it cannot do, since its operatives are associates in its industry: thus we can beat them in the market.' These arguments have been carried out in practice, so that the Association of the Familistere has to-day to compete with establishments that let down wages to their lowest point, and, by these means, practise a deplorable competition, which push the wage-workers to strike and misery." These 'wrongs of egoism,' as M. Godin calls them, are the very things that idealists and reformers of all ages have had to contend against; and the fact that they are certain to recur is the neglected factor in the calculations of so many of the social reformers of our own generation.

PROFIT-SHARING is also the subject of several articles in the same journal. Prof. J. B. Clark of Smith college, and Frank A. Flower, commissioner of labor for the state of Wisconsin, write favoring profit-sharing; but the testimony of two large concerns—the Crane Brothers manufacturing company of Chicago, and the H. O. Nelson manufacturing company of St. Louis—is of more importance and value than any hypothetical arguments can possibly be. Mr. Crane says that his company has tried with much success the plan of permitting the employees to buy stock in proportion to their yearly salary, but, as in many cases the workmen are not prepared to buy the amount

apportioned to them, the plan has been adopted of allotting the stock to them, they enjoying the benefits of it less interest. To this plan, as to any other scheme of profit-sharing, the objection is raised that in bad times it passes into loss-sharing, and this is not what the employees want or will submit to. In view of this, Mr. Crane believes that a surplus fund should be established, from which dividends are to be paid during years of depression, when there is no profit from which to pay them.

Mr. Nelson bears similar testimony to the working of profit-sharing in his company. In March last, the company issued a circular establishing profit-sharing. After allowing seven per cent interest on actual capital invested, the remainder is to be divided equally upon the total amount of wages paid and capital employed. The employees will this year receive about two-fifths of the net profits. The books have not yet been closed for the year, nor the dividend declared, but there is ample evidence of the success of the experiment. At the conclusion of the firm's present fiscal year, the scheme is to be elaborated somewhat. Ten per cent of the profits is to be set aside as a provident fund for sick and disabled members and the families of deceased ones, ten per cent as a surplus fund to cover losing years, should such occur, and two per cent as a library fund, the company paying interest on any unused portions of such funds. The allotments are also to be so apportioned that a premium is offered for continuous service and the saving of dividends. Evidence such as this from the sphere of practical business should be of great help to economists in developing their theories.

THE ITEMS APPROPRIATED by the house for the support of the U. S. coast survey during the next fiscal year are the same as those at first recommended by the house last year, and far under the estimates. If the senate should agree to the penurious policy of the house, a large reduction in the *personnel* of the service must ensue, and its utility would be sadly impaired. We cannot believe the senate will agree to the recommendations of the house in this important matter. The coast survey is doing good work, which should be encouraged by congress, and liberal appropriations should be made for its proper support.

IS BEER-DRINKING INJURIOUS?

WE have before us a direct and unqualified challenge to the prohibitionists in the form of a pamphlet on 'The effects of beer upon those who make and drink it,' by G. Thomann (New York, *U. S. brewers' assoc.*, 1886). The writer boldly presents the following propositions. 1. Brewers drink more beer, and drink it more constantly, than any other class of people. 2. The rate of deaths among brewers is lower by forty per cent than the average death-rate among the urban population of the groups of ages corresponding with those to which brewery-workmen belong. 3. The health of brewers is unusually good: diseases of the kidneys and liver occur rarely among them. 4. On an average, brewers live longer, and preserve their physical energies better, than the average workmen of the United States. The writer claims that beer is a perfectly wholesome drink, and, in support of this claim, refers to investigations made in Belgium, France, Holland, and Switzerland. He quotes also from the report made by a sanitary commission appointed by President Lincoln to examine the camps of the Union army and their sanitary condition. In examining the condition of regiments in which malt-liquors were freely used, the commission found not only that beer is a healthy beverage, but that it possesses hygienic qualities which recommend its use for the prevention of certain diseases. Mr. Thomann states, that, wherever the effects of the use of beer upon the human body have been examined methodically by competent physicians, it was found, to use the words of Dr. Jules Rochard of the Académie de médecine of Paris, "that beer is a very healthy beverage, which helps digestion, quenches thirst, and furnishes an amount of assimilable substances much greater than that contained in any other beverage."

The charge is often made that American beer is composed of so many poisonous ingredients that it is thereby rendered unfit for consumption; that, while pure beer may be harmless, such beer as is supplied by brewers at the present time in this country is positively injurious. This is met with a reference to the report of the New York state board of health, in which it is stated that an analysis of four hundred and seventy-six samples of malt-liquors had been made, and that they were all found perfectly pure and wholesome, and to contain neither hop-substitutes nor any deleterious substances whatever.

The most interesting portion of Mr. Thomann's pamphlet is that which deals with the statistics of the physicians under whose professional care the men employed in the breweries are placed. About five years ago the brewers of New York, Brook-

lyn, Newark, and the neighboring towns and villages, established a benevolent bureau for the relief of their sick and disabled employees. Physicians are appointed, whose duty it is to attend the sick members of the bureau, and a record is kept of all cases of sickness and death which occur. The number of deaths which took place among 960 brewery workmen in five years was 36, — an average of 7.2 per annum, or a death-rate per 1,000 of 7.5. The United States census gives the rate per 1,000 of the urban population of the same ages, as 12.5; or, in other words, the risks incurred in insuring the lives of habitual beer-drinkers are less by forty per cent than the ordinary risks of such transactions. The death-rate per 1,000 in the regular army of the United States in 1885 was 10.9; so that, even as compared with the soldier in peace time, we find that the brewery workmen have a great advantage in point of low rate of mortality.

Mr. Thomann gives us a number of interesting facts connected with the breweries and the workmen engaged therein. In every brewery is a room, called the 'Sternenwirth,' in which beer is constantly on tap, to be used by every one at pleasure and without cost. Every one drinks as much beer as he thirsts for, without asking, or being asked any questions as to his right to do so. The average daily consumption of malt-liquors for each individual is 25.73 glasses, or about ten pints. In the statistics which are given we find that a considerable number of the men consume forty and fifty glasses a day, and two are reported as drinking, on an average, seventy glasses daily. With a view to ascertaining, in the most reliable manner possible, the effects of the use of malt-liquors, the physicians of the benevolent bureau examined one thousand of the brewery workmen as to general state of health, condition of liver, condition of kidneys, and condition of heart. In addition to this, they weighed and measured each man, and tested his strength by the dynamometer. These examinations showed that there were, in all, twenty-five men whose physical condition was in some respect defective; and the remaining nine hundred and seventy-five enjoyed exceptionally good health, and were of splendid physique. There were 300 men who had been engaged in brewing from five to ten years, 189 from ten to fifteen, 122 from fifteen to twenty, and 46 more than twenty-five years. One special case referred to is that of a man fifty-six years of age, uninterruptedly at work in breweries during thirty-two years, who drank beer throughout this time at the rate of fifty glasses per day, yet has never been sick, and to-day is perfectly healthy, vigorous, and active.

The statistics are, to say the least, very surprising, and, unless refuted, will result in modifying to a considerable degree the generally accepted views of the influence of malt-liquors on the health of those who drink them habitually. Mr. Thomann has boldly thrown down the gauntlet, and we shall watch with interest to see who will take it up.

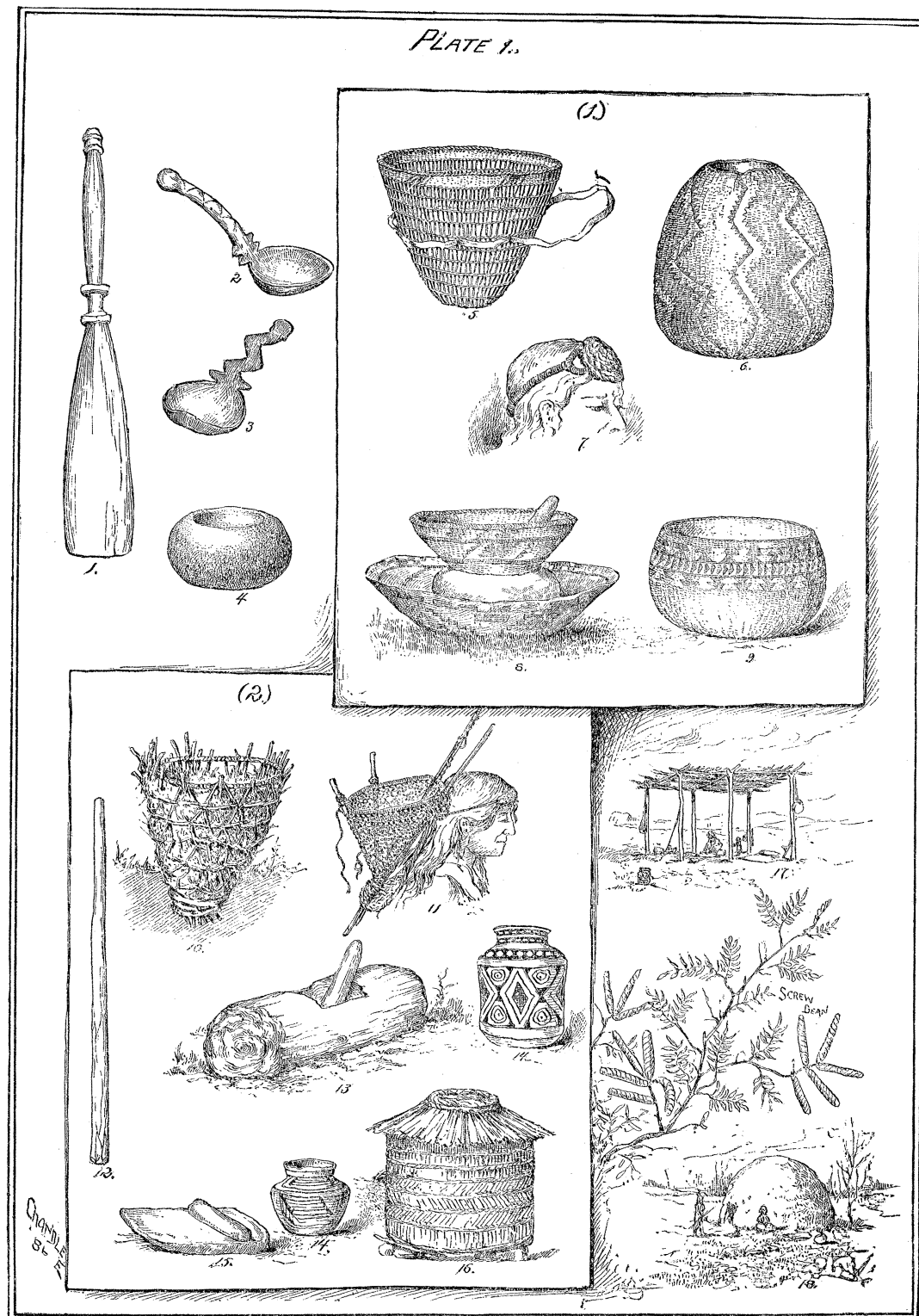
THE ABORIGINAL MILLER.

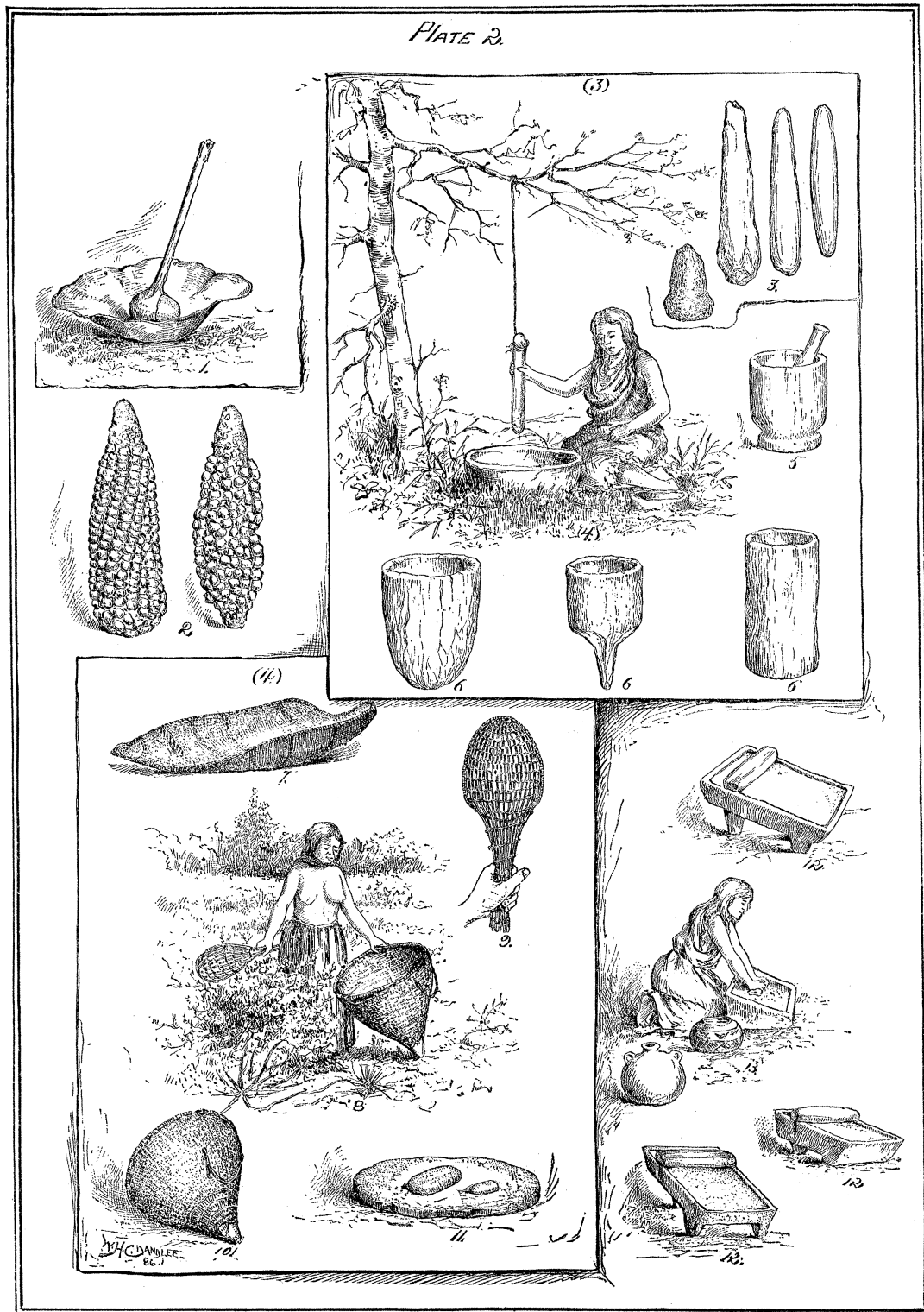
DOUBTLESS it has occurred to many archeologists that the stone arrow-heads, knife-blades, pestles, axes, etc., in their collections are examples of but a small part of the articles once used by prehistoric peoples, the more perishable articles of wood, hide, or bone having long since disappeared. A study of the present arts of savage life — the surest safeguard in speculating about the arts of ancient times — proves this view to be correct, for the number and variety of implements of animal and vegetal origin now used in the camps of savage tribes greatly exceed those of stone. In the present article the implements of the aboriginal miller are introduced in illustration of what has been said above.

The tribes from which the illustrations are drawn are, the Hupa, of northern California (1), from the collection of Lieut. P. H. Ray, U.S.A.; the Pima and the Yuma stock, around the mouth of the Colorado River (2), from the collections of Edward Palmer; the tribes formerly east of the Mississippi (3); and the Utes of the great interior basin (4), from the collections of Major Powell and other officers; with glimpses of the Sioux and the Pueblo miller. It must be remembered that the active agent in all the varied operations of milling, among the savage tribes, — as well as of tanning, shoemaking, tailoring, weaving, the manufacture of pottery, and other peaceful industries, — is always a woman.

In describing the illustrations, I shall first refer to the sketches in plate 1. The Hupa, like all other primitive millers, has to gather the grist before she grinds it. For this purpose she uses a light but strong carrying-basket (fig. 5), made with warp of osier, and weft of the same material split and twined. A soft buckskin strap surrounds the basket, and passes around her forehead, which is protected by an ingenious pad (fig. 7). Her basket being filled with acorns, she trudges to her camp, and deposits them in a granary of closely woven, twined basketry (fig. 6). Her mill is both novel and ingenious, consisting of a pestle, a hopper, a mortar-stone, and a receiving basket-tray (fig. 9). The pestle is like its congeners all the world over; and the hopper has no bottom, its lower margin merely resting upon the mortar-

PLATE I.





stone, to which it may or may not be united by means of pitch. Acorns are poured into this and hulled, and afterward reduced to meal. In those instances where the hopper is not fastened to the stone, the hulls remain above, and the powdered acorns sift down into the basket-tray. Water-tight baskets for 'stone-boiling' mush and for other culinary operations are made by this tribe. The mush-paddle of wood (fig. 1), the ladles of horn (figs. 2, 3), and the small stone paint-mortar (fig. 4), must not be overlooked.

The Pima or Cocopa miller (2) has for her outfit a carrying-net, a bean-crusher, a trough-mortar, a granary, and a 'metate,' besides a great variety of pottery, which the Hupa does not make. It may be mentioned here that none of the great Tinné stock, to which the Kutchin, Athapascan, Apache, and Navajo belong, seem to have made pottery at any time. The bean-crusher (fig. 10) is a cone of coarse strong wattling set in the ground. It is carried to the bean-trees, and in it the pods are broken up by means of a long wooden pestle (fig. 12), so that the miller can get a heavier load into her net. In other words, her 'first process' is crushing the pods in the field. The carrying-net of these tribes is most ingenious, consisting of four frame-sticks, a hooped rim, and a net woven in a very curious and difficult stitch. Besides the net, there is a back-pad made of palm-leaf, a padded head-band, and a forked rest-stick, which the harvester-miller uses as a cane when carrying her load. The gathered beans are stored in beehive granaries (fig. 16) of various patterns, made of straw sewed in a continuous coil by means of tough bark. The 'second process' is the reduction of the broken pods to coarse meal in a wooden trough or mortar (fig. 13). The last process is that of the 'metate,' or mealing-slab (fig. 15). The jars for holding the meal (fig. 14) are cream-colored, decorated in black. In summer the miller works in an open shed (fig. 17), but in cooler weather she transfers the scene of her operations to a mud-covered, wattled hut (fig. 18).

Let us now turn to plate 2. In the eastern part of the United States are found multitudes of well-wrought pestles, such as those shown in fig. 3; but there is a scarcity of good mortars from the same section. This scarcity can be accounted for by the fact that the mortars were perishable, being made of wood. It must not be forgotten that this is the region of maize (fig. 2) and hominy, and until very recently the hominy-logs or wooden mortars (fig. 4) survived on our southern plantations. Even at the present day it would not be difficult to find them in use in the more remote regions. Mr. Schoolcraft gives an illustration (fig. 4), showing how the ingenious miller has in-

voked the elasticity of a limb to lighten her task, and it would be interesting to know whether the miller or the bowyer was the first to make use of this labor-saving device.

The Sioux Indians formerly dried buffalo meat until it could be reduced to meal or pemmican. The outfit of the Sioux miller then consisted of a bowl made of the toughest dried rawhide, and a maul (fig. 1). The stone head of this maul was bound to the slender wooden handle by means of a hood of rawhide, put on green and allowed to shrink. The Ute miller, living in the deserts of the great interior basin, has to utilize every kind of seed that will sustain life. Her set of tools includes a conical carrying-basket (figs. 8, 10), a gathering-wand (fig. 9), a fanning and roasting tray (fig. 7), and a 'metate,' or mealing slab (fig. 11). These mealing-slabs (figs. 11, 12, 13) are common in tropical and sub-tropical America. The conical basket is closely woven, with a buckskin bottom, and has a soft head-band for the miller's forehead. The gathering-wand is an open-work, spoon-shaped frame of twine basketry, and is used for beating seeds into the carrying-basket, as shown in fig. 8. The fanning and roasting tray is shallow, and shaped like a cream-skimmer. It is used to separate chaff from seeds, or to parch the seeds, which are put into the tray with a hot stone, and the whole deftly shaken together. The parched seeds are afterwards reduced to powder on the mealing-stone.

There is scarcely a tribe or people that does not invoke the services of the miller in some manner. Many tribes use a greater variety of stone implements than do those mentioned, and all tribes have their own separate devices for gathering, storing, and grinding provisions. Take the wood and other perishable substances away from these millers' outfits, and we have left an archeological cabinet. In a general and cautious way, add these articles and attachments of animal and vegetal origin to your collection of ancient milling-tools, and you will have a comprehensive notion of the milling methods in the olden times.

O. T. MASON.

PARIS LETTER.

Two of the many posts formerly held by the eminent zoölogist Henri Milne-Edwards were recently filled by elections at the Academy of sciences and the Sorbonne. Milne-Edwards's successor in the former institution is M. Sappey, who was recently removed from his professorship in the medical school on account of his age. M. Sappey's principal competitor was M. Ranvier, the well-known histologist, who, it must be conceded, ranks higher as a scientist than his more fortunate

opponent; but, as M. Ranvier is a much younger man, he can afford to wait a little for another opportunity, and it is not likely that he will have to wait long. M. Sappey has always worked hard and honestly, preferring the laborious life of the scientist to that of the physician or surgeon. The competitors for Milne-Edwards's professorship in the Sorbonne were Prof. Yves Delage and M. Perrier, professor in the Museum of natural history. M. Delage, who was elected to the vacant professorship, is a very able young zoölogist.

M. Charbonnel-Salle has been appointed professor of zoölogy in Besançon. M. Duchartre's successor as professor of botany will probably be M. G. Bonnier, the son-in-law of M. van Toeghem, the able botanist of the Museum of natural history. This relationship is really the only reason for his election, as he has made no good personal investigations to speak for him. The comments and criticisms on the future professor's abilities and talents are most unfavorable.

Paul Bert's successor will most likely be M. Dastre, a good worker and a learned man, who was for many years the assistant of M. Bert. His researches concerning vaso-motor nerves are much valued. Professor Chauveau of Lyons has been appointed to the Museum of natural history in the place of M. Bouley, who died some time ago. He is a thorough physiologist, and has done much good work, especially on microbes and the physiology of the circulatory system. His appointment is highly approved, but it is regretted that he did not compete for the professorship left vacant by the death of Paul Bert. Some interesting elections will soon take place in the Academy of sciences to fill the seats of MM. Bert and Robin. Professor Ranvier will most likely be elected to Robin's place. For the other there will be two principal competitors, — Germain Sée and Charles Rochet. The latter gentleman has many chances, and his election would meet with general approval.

At a recent meeting of the Société de biologie, MM. Fontan and Ségard read an interesting paper on the applications of suggestion to therapeutics. The writers have collected a hundred cases in which they have availed themselves of the possibility of putting their patients into an hypnotic state, to suggest a partial or entire cure. Their conclusion is, that suggestion may be of great value in cases where disorders of the motor or sensory powers exist, or even where there are anatomical disorders affecting the circulatory or secretory systems, such as follow upon traumatism or upon general diseases, such as rheumatic diathesis and others. They have employed hypnotic suggestion in cases of traumatic arthritis,

cerebral shock, urethritis, dyspepsia, and acute rheumatism, with good results, in most cases having been able to effect a complete cure in from three to six sittings. It may be added that none of the patients were at all hysterical. From a perusal of the observations quoted by the gentlemen named, it would seem that the influence of the mind on the body is greater and deeper than has hitherto been imagined. The way in which MM. Fontan and Ségard operate is very simple. The subject is put into an hypnotic trance (only three per cent of the patients are refractory to this part of the process), and is told, for instance, that his knee (in a case of hyarthrosis or arthritis) will work easily and without pain, or that (in a case of dyspepsia) the most indigestible foods will be easily digested. Generally the cures have been effected in a progressive manner, the disappearance of one symptom being suggested at the first sitting, that of some other at the next, and so on.

A paper on skin-grafting from the frog to man was read at another recent meeting of the same society by Dr. Dubousquet-Laborderie. The experiment was tried in the case of a man whose feet had been burned by molten iron. On one of the wounds Dr. Dubousquet put four grafts of human skin; on the other, four grafts from the skin of a frog. All of them took firm hold on the wounds. The frog-skin grafts retained their peculiar color a few days, afterwards changing to the color of the human skin. The healing process progressed rapidly, owing in part to the strict antiseptic precautions taken.

Merlatti, the rival of Succi, has successfully completed his forty-days' fasting experiment, though the medical committee appointed to watch the proceedings were of opinion many times that the experiment ought to be abandoned, owing to alarming symptoms. Merlatti, however, was determined to persevere, declaring that nothing would induce him to eat a morsel of food before the appointed time. He is naturally a hearty eater, and had prepared himself for his long fast by devouring a whole roast goose. When he ended his fast the other day, his stomach, so long accustomed to entire rest, refused at first to retain food. Succi continues his experiment with entire success. These experiments, as well as others of the same nature, are all very well, but in none of them has sufficient proof been afforded that fair play prevailed from beginning to end. One doubtful or suspicious member in a committee is sufficient to render valueless the whole experiment. There is also the possible dishonesty of the fasters themselves, and it may be remarked that in no experiment of the kind hitherto performed has fraud been impossible.

A man who walks about the streets, and who receives crowds of visitors daily, may, by the aid of an intelligent friend, obtain food in spite of the strictest surveillance. On the other hand, in these experiments more attention ought to be given to variations in weight, hourly as well as daily, and also to the excretion of urea. If these points were carefully studied, interesting and useful facts could be learned, and a better control of the patient secured. Of course, these experiments of Succi and Merlatti have brought forward numerous imitators, and many Italians may be met here who profess to be able to fast three, four, or even six months. Some, like Succi, pretend to possess a marvellous liquor; others, like Merlatti, do not. There is one faster in Brussels, another in London, a third in Algiers, while others flock in to Paris from different towns; and the daily papers publish a great number of anecdotes of persons of all descriptions and ages and colors who have lived longer or shorter periods of time without taking a morsel of food. But these stories are not much believed in. Many comments have been drawn forth from medical quarters by the fasting experiments mentioned, M. Bernheim of Nancy offering the ingenious suggestion that they may be accounted for on a theory of 'auto-suggestion.'

A work of much interest was begun some time ago in Cairo, — that of disinterring the Sphinx of Giseh. According to the latest reports, about one-third of the sand in which it is embedded has already been removed. The fore-paws and the right side have been partially brought to view. The paws were not hewn in the stone, as the rest had been, but were built up of bricks, owing, no doubt, to the less solid nature of that part of the stone in which they would otherwise have been carved. Viewed from above, the disinterred part seems inharmonious, but a judgment as to the general effect cannot be formed until the sand is entirely removed. It may then prove to be of less harmonious proportions than such monuments generally are; and in that case, as M. Maspéro thinks, it must be ascribed to an age more remote than that of the pyramids.

The conseil général of the department of the Seine decided at a recent meeting that it would be necessary to create a laboratory for the study of contagious diseases of animals. This is for the special purpose of preventing diseased meat from being introduced and sold in Paris.

A curious lawsuit is pending before the court of justice of Paris. It is especially curious on account of the facts upon which it is based, the pretended discovery of a method of extracting considerable amounts of gold from buhr-stone,

a siliceous stone of tertiary formation, very abundant in the neighborhood of Paris. One chemist has declared, that, by the aid of this new method, from three to two hundred and forty grams of gold may be extracted from each ton of stone. Another says he has found as high as five hundred grams per ton, besides silver and other metals. On the other hand, civil engineers say they have not found an atom of the precious metal in the stone. Three hundred dollars in gold would certainly seem a pretty good yield for that sort of rock; but the whole thing seems chimerical yet, and the people who have invested their money in the business say it does not pay at all. They do not believe in the method now, and have begun suit against the inventor to recover the coined gold he extracted from them.

Professor Lépine of Lyons has published in the *Semaine médicale* a paper on the physiological action of a newly discovered antipyretic or antifebrile, studied by MM. Cahn and Hepp of Strasbourg a short time ago. This antifebrile does not affect the healthy organism when given in a fifty-centigram dose. If a greater quantity is given (double or treble the dose mentioned), there may be present some cephalalgia, with cyanosis. When given to feverish patients, it abates the fever in a marked manner. It must be given at the highest point of the daily rise of fever, or, better, an hour before, in case the precise moment is known beforehand. The dose of fifty centigrams is the one usually preferred. The patient derives great benefit, the body temperature remaining normal or low, the heart pulsating with the same or increased energy, with a general feeling of well-being present. Some very remarkable cures have been effected in cases of typhoid and malarial fever. Professor Lépine speaks very highly of the antifebrile in cases of feber dorsalis as an agent to be used when neuralgic pains—so very rebellious and troublesome to the patient—are present. One or two fifty-centigram doses are enough in most cases, and the pains disappear in about half an hour. This fact, a useful one to know, had not been heretofore noticed. V.

Paris, Dec. 20.

NOTES AND NEWS.

THE administration of General Hazen as chief signal officer is to be credited with the organization and encouragement of our system of state weather-services, which is rapidly extending in all parts of the country. This work is especially in charge of Lieutenant Dunwoody, and local services are now established in Louisiana, Alabama, Nebraska, Mississippi, Georgia, Minnesota, Ohio (by legislative enactment, making an appropri-

ation of two thousand dollars per annum to equip and sustain it), Indiana, Tennessee, Iowa, Illinois, Missouri, New Jersey, Michigan, Kansas, and New England (under the auspices of a meteorological society). North Carolina, South Carolina, Pennsylvania, and Arkansas are in the process of organizing them. Dr. C. W. Dabney, jun., has been appointed director of the North Carolina, with headquarters at Raleigh; and the first number of his *Weather-review* for December last promises a successful service. Already a hundred and sixty-five towns and stations are informed of the daily weather-predictions, by special messages repeated from Raleigh; and at thirty-two of these points flag-signals of the new pattern are now displayed for public information. By combination of telegraph and post-office service, the announcement of cold-waves will be made very general. Local observation will also be attended to, and twenty-nine stations were to be equipped ready for record by the first of the year, besides eleven signal-service stations in and near the state. No funds are as yet appropriated by the state for cost of instruments.

—The report of Dr. Willis G. Tucker, analyst of drugs to the state board of health of New York, contains much that is of interest to the public, dealing as it does with the drugs which are daily prescribed by physicians in the treatment of disease. The total number of samples collected and examined was 194, of which 49.2 per cent were found to be of good quality; that is, to conform to the requirements of the U. S. pharmacopoeia; 29.2 per cent of fair quality falling not far below these requirements, and 19.1 per cent of inferior quality, some of them being entirely fictitious. The cream-of-tartar which was purchased at the drug-stores showed 96.24 per cent of purity, while that from the groceries was but 87.48 per cent, and one sample only 79.31 per cent. In addition to these, eight others were purchased at groceries and purported to be cream-of-tartar, but were, in fact, either grossly adulterated or entirely fictitious, being made up of acid phosphate of lime, starch, and sulphate of lime. Dr. Tucker's advice would seem to be, that, when pure cream-of-tartar is wanted, it should be obtained from the drug-store, and not the grocery. The vinegar sold at the groceries also comes in for condemnation. Dr. Tucker says that an article so largely used in the preparation of food ought to be both free from adulteration, and of good strength as well; but the results of the examinations so far made, show that here, as elsewhere, wide differences in quality exist. The addition of mineral acids is very uncommon; but much vin-

egar is sold which has been plentifully watered, and the greater part of that sold as cider-vinegar is a so-called white-wine vinegar colored by caramel, with perhaps some cider-vinegar added to give flavor. 85.2 per cent of the samples examined came below the legal requirement. The standard required is "not less than four and one-half per cent by weight of absolute acetic acid in all vinegars." Only 14.8 per cent of the samples tested contained the required amount, the highest percentage being 6.2, and the lowest 1.8, the average being 4 per cent.

—The crown and flint glasses of the great objective of the Lick observatory arrived safely at the summit of Mount Hamilton on Monday, Dec. 27.

—Since printing the article in last week's *Science* on 'The prisoners of the Soudan,' we learn by papers from Europe that Mr. Stanley offered his services to the English government to command an expedition to be sent to the relief of Emin Bey; that this offer was accepted, the expenses, estimated at \$150,000, to be defrayed by the English and Egyptian governments. Mr. Stanley, immediately upon his arrival in England, after conferring with the English government, went to Brussels to obtain permission of the king of Belgium, as the head of the Kongo Free State, to undertake this expedition. Mr. Stanley goes directly to Zanzibar, thence to the south end of Tanganyika, and thence all the way by boats to Wadelai. The Belgium papers say that this is a much longer and more dangerous route than the one by the Kongo and the Arouhuimi.

—The *American railroad journal* and *Van Nostrand's engineering magazine* have been consolidated, now appearing as the *Railroad and engineering journal*, under the editorial management of M. N. Forney. The new monthly is devoted to the discussion of engineering and mechanical topics, with special reference to railroad construction and operation. The January number is well illustrated, and contains a good table of contents.

—The following are the recent assignments in the *personnel* of the coast-survey service. Asst. J. D. Baylor has left for Cedar Keys, Fla., to establish magnetic stations between that place and Washington, some seven or eight in number. He will finish the work about April 1. Asst. O. H. Titman and Mr. Henry G. Turner as aid have taken up the primary triangulation work from Alabama towards Mobile; Asst. J. B. Weir, Sub-Asst. McGrath, and Mr. W. D. Fairfield have left Washington to take up the transcontinental geo-

detic levels; and Asst. F. W. Perkins will organize his party about Jan. 15 for work on the south coast of Louisiana. All parties on the Pacific coast are out of the field, except those parties engaged in the resurvey of San Francisco Bay and vicinity. Early in April Assistant Pratt will take up the recognizance of the west coast of Washington Territory from Cape Flattery to Gray's Harbor, a very important work. The steamer Bache has arrived at Key West preparatory to entering upon field-work on the west coast of Florida.

— The Cosmos club of Washington held its first regular meeting for this year in its new clubhouse last Monday evening. The following officers were elected: president, Dr. John S. Billings; vice-president, Dr. John S. Yarrow; secretary, T. M. Chatard; treasurer, William Bruff; house committee, Mr. J. B. Marcou, Dr. John F. Head, and Mr. William Poindexter; library committee, Dr. S. M. Burnett, Dr. Newton S. Bates, and Mr. Joseph C. Hornblower. The proposition to increase the membership was postponed to a special meeting to be held Jan. 31.

— Governor McEnery of Louisiana has issued a call for an interstate convention in the interest of stock-raising, dairying, fruit-growing, and general agriculture, to be held at Lake Charles, La., on the 22d, 23d, and 24th of February, 1887.

— A curious affection exists among the horses of north-western Texas known as 'grass-staggers.' It is caused by their eating the 'loco-weed,' and the affected animals are said to be 'locoed.' At first they lose flesh, and then become weak and staggering, and finally crazy. The Indians believe that an insect is the cause of the disease; but Dr. Carhart of Texas, in a letter to the *Medical record*, says that he has examined the weed, but can find no insect life upon it.

— A remarkable specimen was presented some years ago by the curator of the British museum to the Zoölogical society of London. It was the body of a chicken whose beak and feet closely resembled those of a parrot. Several such instances occurred in the same poultry-yard, and were attributed by the owner to the fact that one of the hens had been frightened by a parrot. Many instances of deformity are on record in the human species, which are popularly attributed to maternal impressions received during the formative period. The number of these is so great as to have led physicians and others to look upon such results as something more than mere coincidences. In a recent paper read before the orthopedic section of the New York academy of medi-

cine, Dr. T. L. Stedman discusses the influence of maternal impressions in the etiology of congenital deformities, and produces evidence which seems to indicate that there are laws in development which are as yet but partially understood, and which, when thoroughly investigated, may explain these remarkable instances to which we have alluded, and of which Dr. Stedman gives many striking examples.

— The presence in New York City of a number of cases of beri-beri, or kak-ke, has re-awakened medical interest in this peculiar disease. The patients came from San Francisco by vessel, and three of them were taken to Bellevue hospital. Two of these died. On the voyage, most of the crew were affected with the disease, and some of them fatally. This affection prevails in Japan, India, South and Central America, and in the islands of the Gulf, and is technically considered to be a multiple neuritis, or an inflammatory condition of the nerves. As a rule, the spinal nerves alone are implicated, but occasionally the cranial nerves as well. It has been demonstrated with a great degree of probability by Cornelissen and Sugenoja that beri-beri is an infectious disease, the specific cause being a micro-organism resembling the bacillus of anthrax, which is found in the blood, muscles, and nerves. In the cases at Bellevue the nature of the disease was not recognized at a sufficiently early stage to enable the physicians to study the microbes, or to make any cultures of them.

— We are familiar in the east with tumbler-pigeons, and in the Central States there are curious beetles, that, from their habit of rolling along little balls of clay, have received the popular name 'tumble-bugs;' but it is upon the plains of the west that one of our common weeds is so modified by its environment, and forms habits so novel, that it loses its eastern name, and is known as 'tumble-weed.' According to C. E. Bessey (*Botanical gazette*, xi. p. 41), "upon the plains and prairies of the west our common weed *Amarantus albus* grows into a compact plant, whose stout, curving branches give it an approximately spherical form. The autumn winds break the main stem near the ground, and the upper part goes rolling and tumbling before the wind, often for miles. This is an excellent illustration of the effect of climate on the physical development of the plant-body, as in the east the species is a straggling herb, remaining rooted long after its death at the close of the season. Dr. Newberry has told us that it is also known as the 'ghost-plant' in allusion to the same habit, bunches flitting along by night producing a peculiarly weird

appearance. It is doubtless very efficient in the distribution of the seeds, and accounts for the wide dissemination of the species on the plains. Professor Bessey notes a similar habit in *Baptisia tinctoria* on Martha's Vineyard, Mass., and *Panicum capillare* might also be cited as another example."

LETTERS TO THE EDITOR.

*.*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Atmospheric lines in the solar spectrum.

Excuse me; but in Professor Pickering's note on p. 13 of *Science* for Jan. 7, have not the types twice made him change M. Cornu's name to 'Mr. Conner'? If so, you best know whether the misprint be worth your correcting, though it was a very natural one for the printer to make. JAMES EDWARD OLIVER.

Ithaca, N.Y., Jan. 9.

A hairy human family.

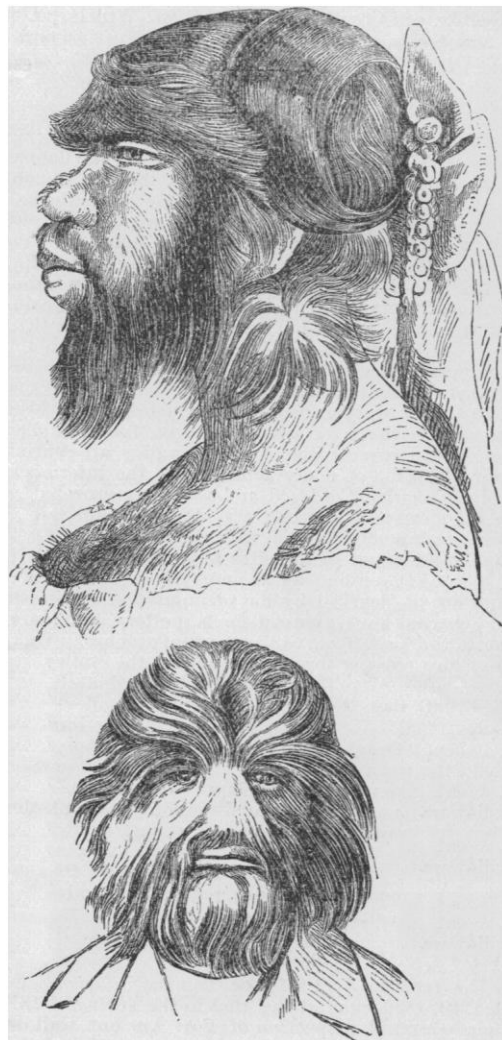
The abnormal growth of hair, that has been not rarely observed since antiquity in individuals of different races of mankind, presents various points of interest other than anthropological ones. As Professor Mason has stated (*Science*, ix. No. 205), its recently recognized cause is the persistence of the prenatal downy hair, 'lanugo' as it is called, and its rich growth through life; or rather, to speak more accurately, the non-development of the hair-follicles to adapt them to the growth of normal hair. This persistence of the embryonal covering is most strikingly shown, as a normal condition, in the ostrich (*Ratitae*), Apteryx, and penguin, where the hair-follicles, or, what is anatomically the same, the feather-follicles, produce through life the soft downy plumage of the chick only. This loss of the foetal hair, which takes place with the general exfoliation of the cuticle during the first year of life, is not characteristic of man, but occurs in many other, though not all, mammals. Wiedersheim (*Vergl. anat.*, 31) sees in this lanugo, and its abnormal development in the 'hair-men,' a probable evidence of an abundant covering of hair at some early period of man's ancestry.

The extent to which this abnormal growth of the downy hair may reach will be better appreciated from the picture, here given, of Teftichew (or Testichew), the elder Russian 'dog-man,' than can be from any description. The 'animal' or dog-like appearance in this case is more striking than in any other of which I have seen illustrations, though the Amras family of the sixteenth century presented a very similar aspect. In this family, the father, son, and daughter were all covered, according to the paintings and descriptions now extant, over the entire body with long hair, with the exception of a space below the eyes.

In the notable case of Julia Pastrana of Mexico, a most repulsive-looking person in her picture, the hair of the head, forehead, and face, was coarse like ordinary hair, and her cheeks and nose were nearly bare. She died in 1860, in giving birth to a son, who early showed similar hairiness on head and face. The prenatal hair is not necessarily soft and downy. Pathological conditions will cause it in places to be

coarse, like that of the adult; and cases are known where the larger part of the body has remained through life covered with a thick coat of strong hair, due, in reality, to an enormously large mother's mark. A similar condition is found in the coarser and more bushy growth of the beard from long-continued neuralgia or nerve-irritation.

Yet another point of interest is the undoubted



JULIA PASTRANA.

ADRIEN TESTICHEW.

tendency to heredity which these abnormal cases show. Thrice has the anomaly been known to be developed in the second generation; and once, the Birman family, in the third generation. On the other hand, the precisely opposite condition, that of absolute hairlessness from prenatal causes, not a few cases of which have been observed among different

ances, shows the same tendency to heredity. Likewise, supernumerary fingers, toes, teeth, and breasts in both male and female, and the presence of a short tail, are all undoubtedly capable of hereditary transmission.

The thinly haired African, or the hirsute Tasmanian, as also the great variations in the pilosity of the civilized races, present questions more within the province of the anthropologist; bearded females and beardless males, that of the physiologist, or, possibly, of the suffragist. S. W. WILLISTON.

New Haven, Conn., Jan. 8.

Fort Ancient, Warren county, O.

Following the letter of Mr. Cyrus Thomas in *Science*, No. 201, if Fort Ancient be of as late date as he there suggests, an explanation of its uses, and of the fact that the *débris* which usually marks the site of prehistoric villages is entirely wanting in and about the work, may possibly be found in the river-valley both above and below the fort. The Little Miami valley is, for twelve or fifteen miles north of Fort Ancient, very rich in the remains either of the mound-builders or Indians, or both if they be distinct races. Upon the bluffs and in the surrounding high lands are numerous mounds, many of them of considerable size.

In almost every gravel-pocket which has ever been opened on the river-hills have been found human bones. In several places in the valley are burial-grounds, often of many acres, where the interments were as regularly ordered and as closely crowded as in a modern military cemetery. Pottery, celts, pipes, etc., are frequently found with these remains. On a high bluff about eight miles above Fort Ancient is said to be the site of an ancient village of considerable extent, marked by an accumulation of broken and charred bones, mussel-shells, pottery, etc., varying in thickness from twelve to twenty inches. There are many reasons for believing that the valley for many miles above the fort was not only densely peopled, but that these people were permanent residents.

Recent 'finds' of copper and other implements about the town of Morrow, eight miles below Fort Ancient, give weight to the supposition that the river-valley was peopled in that direction also, and that the work in question served as a refuge or fortress, situated near the centre of a populous and powerful community. I merely make the suggestion that the numerous remains hereabout may have some relation to the origin and purposes of Fort Ancient.

CHAS. A. HOUGH.

Waynesville, O., Jan. 10.

The remarks by Professor Thomas in *Science* for Dec. 10, 1886, remind me that in the spring of 1870 I made a rapid inspection of Fort Ancient, walking completely around its circumference. My sketch shows several corrections and additions to Dr. Locke's map as published by Squier and Davis, notably the long stone steps leading down to the water's edge. My original map is now in the archives of the Ohio historical society in Cincinnati. A general account of my visit was published at the time in the Cincinnati *Commercial*.

It seems to me plausible, that, if this was not a fortified town, then, in the organization of the mound-nation, there may have been, in the latter days of its

existence, a distinct standing army, and that this fort was occupied by such army only for the purpose of protecting the community living in the rich valleys to the southward against the hordes invading them from the north.

CLEVELAND ABBE.

Washington, Jan. 12.

Star rays and the corona.

Mr. Randolph's communication a few weeks ago escaped my attention at the time of its appearance. The difficulties to which he refers may be due partly to the structure of the human eye. Dr. LeConte has resolved that relating to the phenomenon of long rays or streamers appearing around an electric light, due to refraction rather than reflection at the exterior surface of the cornea next the eyelid. The appearance of short rays around a star, Mr. Randolph will find explained in Helmholtz's 'Popular scientific lectures,' pp. 217-219, and an instructive diagram in the same author's 'Physiological optics,' French edition, p. 34, or German edition, p. 24.

Telescope lenses have been made greatly superior to the human eye as an optical instrument. Whatever may be the final explanation of the solar corona, the number of chances is almost infinite that it will not be referred to defects in the structure of telescope lenses and tubes. W. LEC. STEVENS.

Brooklyn, Jan. 7.

To authors of text-books on physics.

Recently, in examining students for admission to college, the writer was again reminded of a small, but, as far as his observation goes, universal error in text-books on physics. It is stated that "the velocity of sound varies as the square root of the *elasticity* divided by the density." In illustration, it is usually stated that the velocity in air is about 1,000 feet, in water about 4,000, and in iron about 8,000. The first two are perfectly elastic, and the second is the more dense: hence, by the rule, the velocity in water should be less than in air. Iron is less elastic and more dense than either of the others, and hence, by the rule, the velocity should be least. The rule will be correct if for 'elasticity' we read 'co-efficient of elasticity,' which may be defined as the force which would double the length of a bar, or compress a liquid or gas to half of its volume. I. O. BAKER.

Champaign, Ill., Jan. 8.

The swindling geologist.

The swindling geologist was this week in Springfield, Mass., where he passed himself off as Capt. C. E. Dutton. I cannot learn that he succeeded in victimizing any one except the hotel-keeper of the house where he stopped, owing to the fact that he was early exposed by the commanding officer of the armory, who luckily happened to know Captain Dutton.

He later inflicted himself on me, playing the deaf-mute, calling himself Ivan C. Vassile of the Russian museum, and offering to sell me odd volumes of Hall's 'Geology of New York state.' Suspecting that they were stolen, I declined to buy.

He is a square-faced, smooth-shaven, light-complexioned fellow, of rather short stature, and wore a white felt hat and an army cape. His names and clothes, however, would perhaps hardly serve to

identify him, as he probably has a variety of both. He claimed to be on his way to Albany.

Perhaps if he can be exposed all along the line, he may soon be rendered harmless. F. W. STAEBNER.

Westfield, Mass., Jan. 8.

The West Indian seal.

Mr. Henry L. Ward, a son of Prof. Henry A. Ward of Rochester, N.Y., has recently returned from a special trip to the Gulf of Mexico in search of the little-known West Indian seal, *Monachus tropicalis*, bringing with him a good series of skins and skeletons, including those of both sexes and a suckling. Professor Ward, who has been on the alert for several years for this, until recently, almost mythical species, on learning of the probable locality of a small colony of them, promptly organized, with his usual energy in such matters, an expedition to procure specimens, in which enterprise he was joined by Mr. Fernando Ferrari-Perez, naturalist of the Mexican geographical and exploring commission, who, with Mr. Ward, procured a schooner at Campeachy for a trip to the three little keys north-west of Yucatan known as The Triangles (Los Triangulos). Owing to bad weather, they had but three days at the keys, but their efforts were well rewarded; and the West Indian seal is now in a fair way to be soon represented in several of our leading museums. The only specimens hitherto known to be extant in collections are the one recently acquired by the U. S. national museum (see *Science*, iii. 752), and the imperfect skin without skull presented many years ago by Mr. P. H. Gosse to the British museum. So little was known of the species until recently, that even its generic relations were in doubt, its reference to the genus *Monachus* having been regarded as provisional.

The material obtained by Mr. Ward, at much risk and expense, having been kindly placed in my hands for description, I am able to throw some further light upon this interesting species. Its cranial as well as external characters show it to be unquestionably referable to the genus *Monachus*. The color of the animal proves to vary much with age. The young are at first wholly intense black, remaining of this color doubtless during their first year. As they become older, the color changes to lighter; the dorsal surface becomes grayish black, through a slight gray tipping to the black hairs, shading on the sides of the body into the yellowish white of the ventral surface. The front and sides of the muzzle, and the edges of the lower lip, become yellowish brown; the whiskers change from black or blackish to yellowish white, a few only of the shorter ones remaining dark, either wholly or only at the base. In the younger animals the whiskers are not only much darker than in the adult, but much longer and heavier.

The skull is depressed, broad, and heavy. In general proportions it differs from that of *Phoca vitulina* in the longer, more sloping, and much broader ante-orbital portion, and the much greater thickness of the inter-orbital region, and the auditory bullae are less swollen and relatively much smaller. The dentition is very heavy, the length of the largest molars being 16 mm., with a breadth of 10 mm. The molars are crowded, set somewhat obliquely to the axis of the jaw; the second, third, and fourth have one small accessory cusp before, and two behind, the larger or principal one. These are well marked in

the younger or middle-aged specimens, but become worn and even wholly obliterated in old age. Gray's description of the dentition of the Mediterranean species (*M. albigaster*) applies in every particular to that of the present species.

The nails of the fore-feet are large and strong, the largest being from three-fourths of an inch to an inch in length; those of the hind-feet are rudimentary, being reduced to minute horny points, scarcely visible except on close examination.

The flat skin of the full-grown male measures about seven feet in a straight line from the end of the nose to the point of the tail, the free portion of which latter has a length of three inches. The adult female has a length of about six feet.

Mr. Ward obtained a young one only a few days old, and found nearly ripe foetuses in several of the females taken. This would indicate that the young are born in December.

The Triangles are about a hundred and fifty miles from the Alacranes Reefs, where the species was found in abundance by Dampier about two hundred years ago. Small colonies doubtless still exist on the uninhabited reefs and keys of the Gulf of Mexico and Caribbean Sea. It has been met with off the coasts of Cuba and Jamaica, and has been reported as an occasional visitor to the Bahamas and the Florida Keys.

Mr. Ward calls my attention to the fact that Columbus not only met with it in the West Indian waters, but that his sailors killed these seals for food, nearly four hundred years ago. It is therefore a remarkable fact that the first discovered American seal should be the latest one to become known satisfactorily to science.

The present notice is preliminary to a more elaborate account of the species now in preparation, which will be illustrated with plates of its osteological and external characters. The American museum of natural history of this city has secured skins of an adult male, an adult female, and a young example, and a fine adult male skeleton, which will soon be mounted for exhibition.

J. A. ALLEN.

New York, Jan. 6.

Early forms of writing.

Your remarks (*Science*, viii. No. 202) on Dr. Brinton's paper relating to the early modes of writing must form my excuse for this note.

I have made some discoveries, since the publication of my 'Notes on certain Maya and Mexican manuscripts,' which seem to confirm Dr. Brinton's opinion that the mode of writing which he designates the 'ikonomatic system' was practised to some extent by the Maya scribes,—a fact I had noticed previous to seeing his paper. For example: I find on plate xvii. of the Codex Troano the name of a bird (*Kuch*, in Maya) designated by a compound hieroglyph consisting of two parts, one of which is Landa's letter-character *Ku*, the other the symbol for the cardinal point west, or *Chikin* (according to Rosny). The name of another bird (the quetzal or *Kukuitz*) is denoted simply by a duplication of Landa's *Ku*. A few other characters formed in the same way have been discovered. But, so far as determined, most of the characters are symbolic, where the object intended is designated by a single characteristic, the head being the part or feature usually selected to represent persons and animals. For ex-

ample: a human head with one or two curls of hair signifies a female; deities, as shown by Schellhas, are represented by the head with the peculiar features found in their figures. The bird above mentioned (*Kuch*) is generally represented by a head, with certain lines about the eye, used in the complete figure to indicate the species. An idol is denoted by the character a head, which Dr. Schellhas erroneously supposes to be the symbol for a certain deity. The symbol for game quadrupeds is a rabbit's head mounted on the *Kan* or corn symbol; that for game-birds, a turkey's head on the corn symbol; etc.

Inanimate objects are usually denoted by conventional symbols having as the chief idea some characteristic of the thing represented. For instance: the symbol for house, or hut, found in all the codices, has as its chief characteristics broken lines indicating the thatching, and perpendicular lines suggesting the posts.

I have determined the signification of one character in which color plays a part. This is the symbol for *Ekkuuah*, the god of peddlers or travelling merchants. This is a basin-shaped character, indicating the half of a calabash (*Chu*, in Maya), surrounded by a heavy shading of black (*Ek*, in Maya). It is found accompanying the black deity in the Troano Codex.

A few of the written characters are truly phonetic, but my scant knowledge of the Maya language renders progress in this branch of the subject slow. That there are no true letter-characters, as supposed by Landa, must be conceded. I may add, in closing, that I have discovered in the Cortesian Codex the origin of this author's 'A.' It is the symbol used to denote the turtle (*Aac*), the conventional representation of the head of this reptile, and is in no sense phonetic.

A paper explaining these and other discoveries has been prepared for the bureau annual, and is now in the hands of the printer.

CYRUS THOMAS.

Youngsville, Penn., Jan. 10.

On the coloration of mammals.

I desire to call attention to the arrangements of the color-marks on the skin of mammals, and to attempt to show that some of them are correlated to the distribution of nerves and to the positions of the muscle-masses of the body.

The white stripe on the side of the trunk in *Tamias* is the region of distribution of the superficial branches of the intercostal nerves and those nerves in serial homology with them.

The white patches on the muzzle of the tiger answer to the distribution of the infra-orbital nerves.

The single black stripe on the withers of *Equus taeniopus* lies near the centre of the region of the scapula. In the tiger the abdominal stripes are in the same series with those on the flank. In the locality last named they range over the muscles and the depressions between them without regard to the anatomical conformation of the parts. On the anterior extremity it is quite different. In the lioness the depression between the radial extensor mass and the flexor mass is marked at the distal end of the region with a longitudinal black stripe which is about one-fifth the length of the fore-arm. The skin over the extensors of the carpus is marked by a number of spots, and that over the flexor mass by a few transverse bars. The contrast between the two divisions of the fore-arm is decided.

In both the lioness and the tiger the cervical mass and the gular region are separated by differences in coloration. Two oblique stripes are seen limited to the cervical mass. The depressions between the acromio-cephalic and the brachialis anticus muscles are marked by black stripes.

The general distribution of the spots and stripes on the skin over the scapula, and the muscles which are inserted into it and over the extensor aspect of the anterior extremity, form a separate group from those of the rest of the trunk.

The line of the malar bone of the tiger is distinguished by a broad, irregular bar. A more slender one lies vertically over the masseter muscle.

In addition to the above, it is found that the wrinkles and folds in one animal answer to the permanent skin-bands or pigment-lines in another. The dorsi-facial folds of *Phacochoerus* are in the same positions as the pigment-lines in the zebra. The bands on the trunk of the nine-banded armadillo are the homologues of the transient folds of skin seen in the instantaneous photographs of the hog taken at the time when the limbs of the same side are at the nearest point one to the other.

The medio-dorsal stripe which is so often met with in mammals is probably a sequence of the general deep-lying cause which determines the longitudinal type of the vertebrate form.

The disposition for the neck, withers, and the anterior limb to be more hairy than is the remainder of the trunk, is probably associated with the localization of the marks on the anterior extremity being better marked than are those on the posterior. The fore-limb has connections with the head as exact as with the dorsum as far back as the origin of the latissimus dorsi. In the bison the shaggy surface corresponds quite accurately to the proximal part of the fore-limb and its extrinsic muscles.

A mammal, in leaving the ground, from the hind-limbs hunches up the withers in a conspicuous manner. This region is more thickly haired and more brightly colored in many bats than is the rest of the trunk. Now, in the bat the shoulders and neck are permanently hunched, for the fore-limbs are scarcely at all used for support.

HARRISON ALLEN.

Philadelphia, Jan. 4.

Butterflies in southern Connecticut.

During the summer and autumn of 1884 and 1885, I was collecting butterflies in southern Connecticut. In the first season I found *Pyrameis cardui* very abundant, *P. huntera* comparatively rare, while of *P. atlanta* I saw only two specimens, both of which I secured. The next summer, on precisely the same ground and in the same time, I took all I wanted of *P. atlanta*, only two of the *huntera*, while I did not see a single specimen of *P. cardui*. I should be glad if some one would explain this. I do not imagine my collections could have been extensive enough to seriously affect the abundance of any of the species in the locality.

I might also say, that, of a large number of specimens of *Argynnis idalia* taken in the two seasons, a very great majority were females; and of the males, not one was in a perfect condition, most of them being badly torn and much faded. This would seem to indicate that they appeared before the females.

L. N. JOHNSON.

Evanston, Ill., Jan. 8.

SCIENCE.—SUPPLEMENT.

FRIDAY, JANUARY 14, 1887.

ON THE ENRICHMENT OF THE SOIL BY THE CULTIVATION OF 'ENRICHING CROPS.'

IT is an observation almost as old as agriculture, — certainly much older than the earliest literature of agriculture, — that certain crops appear to increase the fertility of the soil upon which they are grown ; or, to state the case more accurately, they exert a favorable influence upon the growth of the succeeding crop. Red clover is the typical example of such a crop ; and the use of this plant as a means of renovating poor or exhausted soils is co-extensive with improved agriculture. Other crops, on the contrary, have an opposite effect, and are denominated exhausting, as, for example, the cereals.

But while the facts just recounted are sufficiently well known, their cause or causes are by no means so well made out. The first attempts at explanation naturally assumed that the exhausting crops took more from the soil than the enriching crops, or, what amounts to the same thing, that the latter were the medium of conveying materials from the atmosphere to the soil. The enriching crops were also supposed to improve the soil by facilitating the direct acquisition of material by the soil from the air, accomplishing this by shading the soil, by the mechanical action of their roots, and also, in case of root-crops, for example, by the tillage necessary for their cultivation.

Thaer and his school, to whom we owe these attempts at explanation, considered the humus of the soil to be the real food of the plants, and the mineral matters to be unessential, and naturally found support for their hypotheses in the great increase in the organic matter or humus of the soil consequent upon the growth of such a crop as clover, for example. As the progress of investigation brought about a better understanding of the laws of vegetable nutrition and the sources of plant-food, these views as to the action of enriching crops were gradually modified ; but they continued, and still continue, to follow the general lines laid down by Thaer. We now know that the plant obtains from the soil its mineral ingredients and its nitrogen, while the bulk of its 'organic' matter is assimilated by its leaves. It is plainly impossible that a crop should enrich the soil in mineral matters. All crops enrich the soil

in carbon to some extent, since their roots and stubble remain in the soil ; but this carbon appears to be of no *direct* use to the plant. There remains only the nitrogen, and the modern theories of the action of enriching crops are based on the belief that they somehow increase the store of nitrogen in the soil. Indeed, if we substitute nitrogen for humus in Thaer's hypotheses, we have very nearly the views of recent authors.

Before proceeding to discuss these views, however, it will be well to inquire whether this supposed enrichment of the soil is a fact. The benefits of a judicious rotation of crops are undoubted, but they are susceptible of a variety of explanations. A crop like clover, for example, may promote the growth of a succeeding grain-crop in a variety of ways, having no relation to the stock of nitrogen in the soil. Only careful scientific experiments can decide whether such crops actually enrich the soil in nitrogen. Unfortunately, but few experiments upon this subject have as yet been made, and some of those reported are of doubtful value. Considerable interest, therefore, attaches to the experiments made by Strecker in the year 1883-84 at Göttingen, an account of which has recently been published,¹ along with a very complete review of the literature of the subject.

Strecker experimented upon plants and soils in pots, lupines serving to represent the legumes, and oats the cereals. But one of the vegetation experiments of 1883 succeeded ; viz., one with lupines in unmanured sand. From the data given, it appears that the soil and roots remaining in the pot contained only about 40 per cent of the nitrogen originally present in the sand, or introduced in the seed or in the rain to which the pots were exposed. On the other hand, the amount thus removed from the soil was only about 39 per cent of the total quantity found in the aerial portions of the plants : the remaining 61 per cent, therefore, must either have been assimilated directly from the atmosphere or been absorbed from it by the soil. Six pots without plants were also exposed during the summer ; and these showed, without exception, a considerable loss of nitrogen, which, as there was no drainage from the pots, must have passed off into the air. Two of the pots contained unmanured sand with 0.0015 per cent of nitrogen ; and the variations in these were evidently within the limits of analytical error and of

¹ *Journ. f. landw.*, xxxiv. 1.

no significance. The other four pots contained the same sand manured with bone-dust, and these showed an unmistakable loss of nitrogen. This loss, of course, was from the manure rather than from the soil, and it seems probable that it was due to the loss of nitrogen in the free state during decay which has been shown to occur by Reiset, Lawes and Gilbert, König and Kieson, Dietzell, Morgen, and others, including the writer. At the same time, these results show that this loss may take place under the circumstances in which organic matter exists in the soil or in the added manure. Strecker observed that the loss was less when the soil was stirred on the surface than when undisturbed, and greater in the sun than in the shade. He explains the former fact by the hypothesis that the loosened soil absorbed ammonia from the air more freely than the compact one, and thus made good part of the loss just noted.

The experiments of 1884 were made partly in glass pots, and partly in zinc boxes. Both stood under cover, protected from both rain and dew. Some were filled with sand, and some with garden-soil. As before, lupines and oats were used as experimental plants, and pots were also left without plants for the purpose of observing the loss of nitrogen noted in the previous year's experiments.

Strecker's principal conclusions from his results were as follows:—

1. A naked soil exhales during the summer considerable quantities of nitrogen. The loss is greater from compact than from stirred soil. The results of the experiments of 1884 upon this point were of the same character as those of 1883; that is, the results in the sand alone are of no significance, while those in the manured sand show in reality a loss of nitrogen by the manure. In addition to this, however, one of the pots with garden-soil showed an unmistakable loss of nitrogen.

2. If the soil is occupied by oats or lupines, this loss of nitrogen is diminished. Some loss was still observed in most cases; but when lupines were grown in unmanured sand, the results, calculated on the basis of the minimum percentage of nitrogen originally found in the sand, showed a gain of nitrogen by the soil and roots. An unmistakable increase of the nitrogen of soil and plant over that of soil and seed was noted in several of these trials in unmanured sand.

3. In all cases in which the soil was tolerably rich in nitrogen, less nitrogen was found in it after the growth of a crop and the removal of the aerial portions than was present at the beginning of the experiment: in other words, there was no enrichment of the soil.

4. No essential difference was observed between lupines and oats. Both drew their supply of nitrogen from the soil, and, in most if not all cases, left it poorer than they found it.

It will be seen that Strecker's experiments give little countenance to any hypothesis of a gain of nitrogen from the atmosphere. In this respect they differ from the results reported by Atwater.¹

The latter experimented upon peas grown in sand and watered with a solution of plant-food, and found in nearly every case much more nitrogen in soil and plant than was supplied in seed and nutritive solution. His results, however, do not bear directly upon the question under discussion, because he removed the whole plant, including the roots, from the soil, and determined only the total nitrogen in roots and tops and the residual nitrogen of the soil. It would seem, however, that, if plants can gain so large a proportion (up to 50 per cent) of their nitrogen from the air as they did in these experiments, they might very well enrich the soil in nitrogen through their roots and stubble. Strecker's experiments are very interesting as regards the relations of soil and plant to the nitrogen supplies of the atmosphere, but they are entirely inadequate to explain the functions of 'enriching crops' in agriculture. Pot experiments, while they permit any exchange of nitrogen between crop and atmosphere to be accurately observed, practically assume that the soil ends at the depth of ten or twelve inches, and take no account of the subsoil as a source of nitrogen. They thus ignore a factor of great importance, and one which affects the question in two distinct ways. In the first place, large amounts of nitrates may escape into the subsoil with the drainage-water. I have discussed in an earlier article (*Science*, iii. No. 48), the results of experiments by Lawes and Gilbert and by Dehérain, bearing on this subject, and have shown that the deep-rooting leguminosae, which have a long growing-season, have an important function in arresting these nitrates, and storing them up in an insoluble form, to be set free again gradually for the use of a succeeding crop. According to Lawes and Gilbert, it is at least probable that the roots of clover in some way serve to convey the nitric ferment into the subsoil (which is naturally nearly destitute of it), and thus indirectly convert the insoluble nitrogen compounds there present into nitrates, which they then proceed to assimilate.

In the second place, it would appear that clover and similar deep-rooting plants may bring up nitrogen from the subsoil and deposit it in their upper roots and stubble. While the soil as a

¹ *Amer. chem. journ.*, vi. 365.

whole is not enriched by this process, the surface soil is, and this concentration of nitrogen in a smaller soil area may greatly facilitate the growth of a succeeding shallow-rooting and quick-growing crop. Drechsler¹ has attempted to show that such an enrichment of the surface soil is impossible. He argues, that, since the roots develop chiefly where they find food, if they find their supply of nitrogen chiefly in the subsoil, they will develop chiefly there, and consequently will not enrich the surface soil. It is not difficult to show, however, that this reasoning is fallacious. It is no more difficult to conceive that nitrogen should be transferred from the subsoil roots to the surface-soil roots, if the latter found an abundant supply of mineral matters at hand, than it is to conceive that both nitrogen and ash ingredients may be transferred from the roots to the aerial parts of the plant, provided the latter find a sufficient supply of carbon dioxide. Let us suppose the surface soil to be absolutely destitute of nitrogen to the depth of six inches, and that the nitrogen of the seed is sufficient to supply the growth of a root down into the nitrogen-bearing layers below. A plant would certainly grow under such conditions; and, when the crop was harvested, its stubble and what roots it had formed in the upper six inches of the soil would contain nitrogen, and the surface soil would be enriched to just this extent at the expense of the subsoil.

It would appear, then, that such an enrichment of the surface soil is possible. But few experiments calculated to demonstrate its actual occurrence have been made. The problem is not an easy one. It is difficult to take samples of a soil which shall be truly average samples; and the percentage differences are so small that they may easily be hidden by an error in sampling. Analyses by Dehérain and by Lawes and Gilbert, however, appear to show that such a gain does take place.

Finally, the relative power of different plants to assimilate nitrogen has an important bearing on this question. Wagner has rendered it probable that leguminous plants are able to assimilate freely the comparatively insoluble nitrogen of the soil, while the cereals require their nitrogen in an easily soluble form. If this is true, one of the functions of enriching crops may be assumed to be to gather the nitrogen of the soil which is unavailable to other crops, concentrate it in its roots and stubble, and yield it up again by decay to the following crop.

On the whole, it does not seem difficult to account for the effects of enriching crops without

supposing that they draw materially from the nitrogen of the air, while not excluding the possibility of their so doing. Whether our agriculture is flourishing, as Lawes and Gilbert maintain, at the expense of the accumulated nitrogen of past centuries, or whether there are processes by which free nitrogen is brought into combination again in quantities sufficient to balance the evolution of free nitrogen which we know to be continually going on, is as yet an unsettled question.

H. P. ARMSBY.

NATURAL GAS.

A LECTURE on the subject of natural gas was delivered at the Franklin institute on Saturday evening, Dec. 18 last, by Mr. Charles A. Ashburner, geologist in charge of the State geological survey. The lecturer stated that natural gas was by no means a recent discovery. Even its utilization for the purposes of the mechanic arts had been successfully attempted in China, where, by pipes of bamboo, it had been conveyed from natural wells to suitable furnaces, where, by means of terra-cotta burners, it was consumed. In the confines of Persia, in the south of France, and in our own western states, burning-springs had long been known. When Lafayette visited this country in 1821, the inn in the town of Fredonia, N. Y., was illuminated in his honor by gas procured from a neighboring well. It is, however, only within recent years that natural gas has arisen to any importance in its bearing on the mechanic arts. At present the great iron and glass works of Pittsburg and of other places are supplied with natural gas as their only fuel, and millions of cubic feet are yearly consumed in Pittsburg and similarly situated cities.

Of the origin of natural gas there seems to be no reasonable doubt. It arises from the decomposition of forms of animal or vegetable life embedded in the rocks in suitable situations. The gas is not believed to be generated continuously, but merely to be stored in porous or cavernous rocks overlaid by impervious strata. When these collections are tapped, the gas is set free, but a new supply is not being formed to take its place. The position at which the gas is found is very variable, depending upon the force of gravity and upon the position of the porous layer in which the gas is confined. The lecturer entered into an accurate description of the localities in which the gas was found, and gave the reasons why it was hopeless, from geological grounds, to look for natural gas east of the Alleghenies. The region in which the gas is found is practically embraced in that portion of Pennsylvania west of the Alle-

¹ *Journ. f. landw.*, xxxi. 30.

gheny Mountains, and extending a very short distance into Ohio, New York, and West Virginia, and it is also stated to have been found in a very limited extent in Illinois and Kansas.

The most important economic locality is that in the immediate vicinity of Pittsburg, which supplies that city with the fuel for the vast iron and glass works and for numerous private dwellings. There are 6 natural gas companies in that city, managing 107 wells, and supplying the gas through over 500 miles of pipe, of which 232 miles are situated in the city proper. The total area of pipe leading into Pittsburg is given as 1,346,608 square inches, and the total capacity of the lines is estimated at over 250,000,000 cubic feet of gas per day. The largest company is the Philadelphia natural gas company, which supplies over 400 manufactories and over 7,000 dwellings with the entire amount of fuel consumed. The composition of natural gas varies greatly, both in specimens from different wells and in those from the same well at different times. In general terms, it can be described as a mixture of hydrogen, nitrogen, and marsh-gas, with occasionally higher carbon compounds. It burns with a nearly colorless flame, and gives off no odor or deleterious matter.

In speaking of the use of natural gas for domestic purposes, Mr. Ashburner pointed out the great advantages which a gaseous fuel has over a solid one like coal, and stated his belief that the greatest of the advantages of the discovery of natural gas was that it had proven the great economy and practical utility of such fuel. A thousand cubic feet of gas was calculated to equal in heating capacity 55 pounds of coal. He stated that the use of natural gas for domestic purposes would not have been possible without the inventions of Mr. Westinghouse of Pittsburg, two of whose inventions the lecturer illustrated. One of these inventions was intended to prevent leakage from gas-pipes, and to locate leaks accurately when they occurred. The leaking gas is conveyed to the nearest lamp-post and there consumed. Another invention was a most ingenious pressure regulator, which not only regulates the pressure at which the gas is supplied to the burners, regardless of the pressure in the mains, but, in the event of the pressure in the mains dropping to zero, automatically shuts off all gas from the house; nor is it possible to turn the gas on again, without violence to the regulator, until every source of escape of gas larger than a pin-hole leak has first been corrected. A model of the regulator was exhibited. The lecture was illustrated by drawings and maps and by a small working model of a well-boring apparatus.

In answer to inquiries, the lecturer stated that the source of natural gas was certainly capable of exhaustion, but that he did not think there was any imminent danger of such a calamity. The sources of supply would certainly last many years; and he believed, that, before they would give out, a method of producing an artificial gas would be invented which would perfectly supplant the present natural gas. The cost of natural gas could not be compared with our coal-gas, for the reason that the natural gas was not sold by meter. The consumer makes a yearly contract with the company to supply him with light or fuel, or both, at certain rates. A house containing twelve rooms costs, to heat and light, from \$70 to \$90 a year. The use of the gas is most satisfactory; for, by means of an automatic regulator, every room of a house may be kept at a temperature not varying two degrees, regardless of the condition of the outside temperature or the pressure on the mains. Defects and troubles were met with from lack of understanding how to properly regulate the supply or the combustion.

In reply to the question as to whether he thought it wise for the city of Philadelphia to lease the gas-works for a term of years, Mr. Ashburner replied, that, as a business-man, he would say that any scheme for supplying the ordinary form of coal-gas was, at the present time, extremely uncertain as a business venture. He believed that a very short time would demonstrate that there was a method of generating a fuel gas which would totally supplant all present modes of heating, and that electricity had already solved the problem of illumination. We were in a transition stage with regard to both heating and light, and for these reasons, and from this standpoint, he would regard any movement as undesirable at this time.

PURITY OF ICE.

THE state board of health of New York has recently published a report on the purity of ice from Onondaga Lake, the Erie canal at Syracuse, and Cazenovia Lake, being the ice-supply of Syracuse. The local board of health regarded that cut from Onondaga Lake as being detrimental to health. Into this lake discharges the creek of the same name; and into the creek is discharged the sewage of the city of Syracuse, which amounts to five millions of gallons daily. At the time the inspection of this lake was made, there was a margin of from one to four feet wide of black, putrefying organic matter along the shores. The analyses of the ice from this lake showed that it contained probably from ten to twelve per cent

of the sewage impurities dissolved in the same quantity of unfrozen water of the lake. This ice also showed the presence of bacteria in great abundance, retarded somewhat in their growth by the ice, but not destroyed by it. It is perhaps needless to say that this ice was pronounced totally unfit for any purposes where it is liable to come in contact with food or drink. The ice from the Erie canal was also condemned, while there was not sufficient evidence to warrant a condemnation of that from Cazenovia Lake. The report, valuable for what has already been mentioned, is still more so by reason of the numerous references to instances in which impure ice has been the cause of dysentery and other diseases. The earliest of these was that at Rye Beach, N.H., reported by Dr. A. H. Nichols of Boston in 1875, in which there broke out among the guests of a large hotel at that place an epidemic of gastro-enteritis, caused by impure ice from a filthy pond. Another instance of sickness caused by impure ice, referred to in the report, is that of an epidemic of dysentery which occurred in 1879 at Washington, Conn., investigated by Dr. Brown of that place and by Dr. Raymond of Brooklyn. The ice had been gathered from a pond which had been used as a wallowing-ground by the pigs. Other instances are quoted of the injurious effects of impure ice upon the public health, and sufficient evidence given to show, that, in the process of freezing, water does not purify itself. The report, taken as a whole, is a very valuable contribution to this subject, and a complete refutation of the old idea that all ice must of necessity be pure.

COLOR-BLINDNESS AMONG RAILWAY EMPLOYEES.

DR. B. JOY JEFFRIES, at the last meeting of the American ophthalmological society, called attention to the total failure on the part of the Massachusetts authorities to enforce the law passed in that state in 1881, by which railroad companies are prohibited from employing persons who are color-blind, or whose sight is defective, in positions requiring them to distinguish form or color signals, unless such persons have been certified by some competent person employed and paid by the company as not disqualified for such positions by color-blindness or other defective sight. A penalty of a hundred dollars is affixed for each violation of the act. In reference to the enforcement of the law, Dr. Jeffries says that "it is practically as dead a letter as the liquor laws." Numerous cases are cited which have come under the care of the speaker in which the law has been

grossly violated. In one case a brakeman who had been on a road three years had been tested as to his vision by the train-despatcher, who had asked him how many knobs there were on an adjacent telegraph-pole, telling him his vision was as good as any one on the road. Another instance of the manner in which the law is violated was that of a gateman who applied to Dr. Jeffries for a certificate for blindness contracted in the army, in order that he might obtain a pension from the government. Although this man was so blind from atrophy of the optic nerve that he groped his way into the doctor's office, yet he was on duty as a gateman at an important railroad-crossing, having a certificate from the examiner of the railroad company "that he is not disqualified by defective sight." The man himself acknowledged that he was completely blind in the sun, and could not see people at his crossing. A number of instances are given where engineers and conductors were employed by railroad companies, although they were completely color-blind. Something of the same negligence seems to exist in the licensing of pilots. One pilot who could not recognize a colored side-light held in the sun six feet before his face was examined by a marine hospital surgeon, and reported as *partially* color-blind. This enabled him to be further examined by the local inspectors, who passed him by their tests, and the man has a full license. In commenting on this case, Dr. Jeffries well asks, "How many more are there?" The matter is one of such grave importance, involving as it does the life and limb of every traveller by land and sea, that the Ophthalmological society could be of no greater benefit to their fellow-beings than in calling the attention of the authorities to these gross violations of the statute, and protesting against their continuance.

COMMISSIONER HADLEY'S SECOND ANNUAL REPORT.

PROFESSOR RICHMOND M. SMITH, writing in the *Political science quarterly* a few months ago, said, in his article examining the various state labor bureaus and their methods, that "the business of collecting statistics successfully is one which requires a great deal of experience, besides knowledge and administrative ability, on the part of the chief," and for the lack of that experience he found the reports of most of the chiefs defective both in method and in results. When Professor Hadley of Yale college was appointed, two years ago, chief of the Connecticut bureau of labor statistics, it was foreseen that statistics collected by one of his ability and experience in handling

economic questions would be of unusual value. The report, which has just been laid before the Connecticut legislature, amply justifies the expectations entertained concerning it. Guided both by the judgment of the chief and a special resolution of the general assembly, the investigations undertaken by the bureau during the past year were restricted to a few topics, and then made as thorough and searching as possible.

The specific questions under consideration were weekly payment and child-labor; and Professor Hadley's report concerning them may be divided into three parts. The first is a bare summary of results, possibly intended for such legislators as lack either the time or the inclination to study the tables of statistics for themselves. The second part is made up of two essays, — on labor legislation and its enforcement, and on the credit system. The third part consists of the tables of statistics, with a brief explanation of them.

In taking up the subject of weekly payment, Professor Hadley first determined the facts as they are. He found, that, of the factory operatives in Connecticut, a little less than two-fifths are paid weekly, a little more than two-fifths monthly, and about one-fifth fortnightly. Aside from salaried persons, it is found that something more than three-sevenths of the hands are paid by the piece, the remainder by the day. The percentage of those paid by piece-work is much greater among the female than among the male operatives. No connection is found to exist between payment by the piece and weekly payments. The concerns that have not adopted a system of weekly payments offer various explanations of their action. Some make no change from their custom of monthly payments because they find no demand for any change; others believe weekly payments to be impracticable; still others believe weekly payments to be a bad thing for the operatives themselves.

Of the 70,000 hands specified in the report, 20,000 are women, and about 3,000 are children. The number of children really employed, Professor Hadley believes to be greater than shown by the figures. With the children, monthly payment is most frequent. It is an interesting fact, too, that the larger the factory, the greater is the percentage of women employed. The number of children reported, on the other hand, is greatest in mills employing between one hundred and two hundred hands. The employment of women reaches the largest proportions in the manufacture of wearing-apparel; that of children, in textile industry, where the percentage averages about nine. The children are principally occupied in tending machinery. The returns as to the wages of these

children show a scale of wages running from about a dollar a day (paid to hands over eighteen years of age) to thirty-five cents a day (paid to the youngest hands).

Of 65,627 hands, about five per cent are employed 54 hours or less per week, twenty-two per cent from 54 to 59 hours, over fifty-six per cent from 59½ to 60 hours, while sixteen per cent have an average working-day of more than 10 hours. The longer hours prevail generally in the textile industries, though barbers reported the longest hours of all, — 92 hours weekly. The cigar-makers, the only trade in which the eight-hour system was carried into effect, show a decided reduction in this respect. In concluding this portion of his report, Professor Hadley says: —

"We thus reach the conclusion that monthly payments, long hours, and child-labor go hand in hand. This fact is in one sense precisely what might have been expected; yet the results are so noticeable that they will bear repeating. First, practically none of the weekly payment mills have a normal working-day of over ten hours. Second, leaving out cases of fortnightly or mixed payment, a minority of men, a majority of women, and a two-thirds majority of children, are paid monthly. Third, less than one-eighth of the men, but more than one-fifth of the women, and more than one-third of the children, are employed regularly over ten hours a day. Fourth, the counties and industries which show the largest proportion of weekly payment, show the smallest proportions of women and children employed, and *vice versa*."

Now, these three things, — child-labor, long hours, monthly payments, — when found co-existing, indicate a society on a low industrial level. Any one of them may be, in exceptional cases, necessary; but the three in conjunction indicate an evil which the state is justified in attempting to remedy by legislation. The discussion which follows as to the practical difficulties of labor legislation and the proper attitudes of labor organizations toward the law, is in every way commendable, and we regret that lack of space forbids our reproducing the most important portions of it. One or two extracts must suffice.

"To make a law worth any thing at all, somebody must be willing to incur the hardship and odium, and, if need be, actual danger, in order that its provisions may be carried out. If a body of workmen demand legislation, and then, either through apathy or timidity, are not prepared to support the officer of the law in its execution, they are simply encouraging sham legislation. It is perfectly easy for a legislator to vote for a law which will satisfy the demands of extremists

and not accomplish its objects. The more extreme the character of the measure, the surer it is of non-enforcement."

"If organized labor takes a fair legal chance for prosecuting the grievances of individuals, it simply gives those individuals a fair chance before the law; if organized labor does not prosecute such grievances, it gives the employers an immunity from interference at present, but at the risk of almost revolutionary consequences in the future.

"There is nothing to prevent the knights of labor, or a trades-union, from being incorporated under the law of the state of Connecticut at present. Though not generally understood, this is a fact."

"Such legislation may help in raising the standard of the community. But let it be clearly understood that it is a rough process, and not a smooth one; that it frequently bears hardest where we should wish to see it bear least; and that it is hopeless to attempt to enforce it, until those whom it is designed to benefit—or, at least, a large part of them—have risen high enough to reap the benefit, and are sufficiently convinced of those benefits to use their own personal efforts for its enforcement."

The last portion of the report which we can mention is that which deals with the credit system. Professor Hadley discusses in order the practicability and the desirability of weekly payments and the best means of securing their enforcement. To most of his argument we give our hearty assent, though we think even more weight should be given to the objections to weekly payments advanced by certain manufacturers, who submit, that, from the very character of their work, its product cannot be properly estimated and paid for every week. We are glad, too, to see that Professor Hadley appreciates the fact that for the best employees weekly payments would be useless, and for the worst they would be worse than useless. The average workman is the one to be benefited by them. The report summarizes this discussion thus:—

"1°. The system of cash payment is a real advantage to the workman. 2°. The difficulties of weekly payment are not so great as is commonly supposed. 3°. But there nevertheless remain a sufficient number of cases to which a weekly payment law could not well be applied, to constitute a serious reason against making the system compulsory. 4°. The same general result could be reached more surely from another direction, by abolishing the factorizing process. This would necessitate a system of cash payments as a rule, and the exceptions to it would regulate

themselves in such a manner as to involve less difficulty. 5°. We therefore recommend that the legislature pass a law exempting the wages of all mechanics, journeymen, or laborers, from attachment for debt; with such additional legislation as may be necessary to prevent its effects from being evaded by the systematic assignment of wages on usurious terms."

With reports such as this of Commissioner Hadley, and those of Carroll D. Wright of the national and Massachusetts bureaus, before us, we can conscientiously commend the sagacity of Dr. Engel, one of the most eminent statisticians in Germany, and late chief of the Royal statistical bureau of Prussia, when he said that his ambition would be satisfied if he could accomplish in Germany the same work that was being done by some of the American statistical bureaus.

SEDGWICK AND WILSON'S BIOLOGY.

THE old and thoroughly vicious notion that "the power of repeating a classification of animals with appropriate definitions has any thing to do with genuine knowledge," is slowly disappearing before the advance of a rational method of teaching biology; namely, that of bringing the student face to face with the objects of his study. Much of this reform is due to Huxley and Martin's 'Elementary biology,' which appeared some ten years ago. In the book before us two of Professor Martin's former pupils undertake to elaborate and improve his plan of instruction, intending it to serve as a factor in general education or as "a basis for future studies in general biology, botany, zoölogy, or medicine."

After a general introduction, and chapters on the composition of living organisms, on protoplasm (which contains several pages on organic chemistry), and on the cell, then follow the long and very careful accounts of the bracken-fern and earth-worm, the typical examples selected of vegetable and animal life. The anatomical, physiological, and embryological aspects of the subject are (for an elementary work) treated with unusual fulness of detail. The authors have done wisely in not following Huxley and Martin's order of treatment, which begins with the unicellular organisms. This is the logical order, but it is beset with practical difficulties. As a matter of fact, most teachers will agree that beginners take most interest in, and succeed best with, forms which they are accustomed to see around them. The structure and functions of microscopic forms are really much more difficult for the beginner to

General biology. By WILLIAM T. SEDGWICK and EDMUND B. WILSON. Part I.: Introductory. New York, Holt, 1886. 8°

grasp than those of the higher animals and plants. On the other hand, if too differentiated types be selected, the mass of detail becomes somewhat embarrassing. One may doubt, however, whether the earth-worm is the best selection that might be made, on account of its small size and the rather skilful dissecting it requires. To those who do not accept the annelid origin of the vertebrates, its supposed central position and clear relation to the animals above it are not so apparent.

A novel and most valuable feature of this book is the attention devoted to physiology and embryology. This method of treatment will no doubt prove most attractive and stimulating to the student, as well as give him a much more just and adequate conception of the subject than is possible from anatomical methods alone.

As a whole, the work is excellently done, and the points to which one may wish to take exception are of minor importance. There is not quite enough distinction between fact and inference. For instance: while few naturalists reject the theory of evolution, it seems hardly in place in an elementary text-book. Huxley's example, in respect to matters of theory, is a good one. Then, too, the amount of physics and chemistry is somewhat unnecessary: if the student knows the elements of these sciences, it is superfluous; if not, it is insufficient. But these slight criticisms notwithstanding, we can sincerely congratulate the authors upon their work, and cordially commend it as a very valuable aid to teachers.

The publisher's share of the book is excellent as to print and paper, but the execution of the illustrations is not all that could be wished. Unfortunately this is a complaint that must very frequently be made of American scientific books.

ABBOTT'S UPLAND AND MEADOW.

THE author of 'Upland and meadow,' Dr. C. C. Abbott, tells us the secret of his success on the very first page. To him every half-acre is an inexhaustible zoological garden, every creature is companionable, amusing or instructive or both, and thus no ramble can be lonely, nor even the shortest walk through the tamest region uninteresting or uninteresting. But, like many other secrets, this is of little use to any except those fortunately to the manner born.

The relation between the author and his (generally feathered or furry) friends is not merely one of companionship, but of good-fellowship, comradeship. There is a sympathy between them. He continually tries to put himself in feeling in their

place, not only by his kindness, but by the practical jokes which he plays upon them (see pp. 76-79 and 209) and his keen enjoyment when they use the opportunity to laugh at him. The questions which he answers, and the experiments which he tries, are those which would occur to no mere anatomist or pure systematist, but only to one to whom all nature is in a certain sense akin, and who desires an *inside* view of it. And this, combined with a keen sense of the humorous and a command of a simple style and plain English, constitutes the great charm of the book.

We cannot but feel, however, that what he sees in the birds is often a reflection of his own keen humor; that he often transfers to their minds trains of thought which really exist only in his own; and that, while his observation may be entirely correct, his inferences from them are those of a warm friend rather than of an impartial judge. But one is disposed to pardon the author for this, especially while reading his pages.

The book is throughout a study of animal life, not of dead animals. It is a plea for the study of life-histories, of the habits, instincts, feelings, and thoughts of the common animals. It is a book which would encourage boys to observe, and give the young naturalist an introduction to a field for work unfortunately too sadly neglected by the present generation of scientific men. Why should not every one have a 'Poetquissings Creek'? Every one knows of similar streams, with their uplands and meadows teeming with a life of which we know practically nothing. It is hard to see how any one can read the bright and attractive pages of this book without making a firm resolve to observe more widely and carefully than he ever has before; and a book which will make boys and girls, and men and women, more observing is certainly doing the very best educational work. If love to being in general is the essence of virtue, we shall all certainly be the better for reading it. But the scientific man will also find in it much useful information, and many valuable observations of the occurrence and habits of some of our less known and studied animals.

ACCORDING to the *Lancet*, a new anaesthetic has been discovered in Australia. It is called drumine, and is obtained from the *Euphorbia Drummondii*. It is local in its action, and has certain advantages over cocaine, which is now so extensively employed for local anaesthesia. Its effects are as yet not sufficiently understood to warrant the acceptance of all that is claimed for it; but it will doubtless be investigated further, and its efficacy and value be more thoroughly established.